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presented. As geologists and as citizens of no mean countries we ought to present this matter clearly to men whose fortunes have come through application of principles discovered by obscure workers. Such men are quick to perceive the justice of the claim and usually are ready to pay a reasonable interest on the debt.

The world must advance or retrograde; it cannot stand still. Continued advance in physical comfort and intellectual power can come only through intenser application to investigation along the lines of pure science, which can be made possible only by affording increased opportunities for research in our colleges and by the expansion of research funds held by societies such as this.

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FISHES OF THE SOUTH SHORE OF LONG ISLAND.

INVESTIGATIONS carried on by the New York State Museum from July to September and continued by the U. S. Fish Commission until near the close of October, 1898, in the waters of the southern part of Long Island resulted in the collection of eighty-four species of fishes belonging to the region.

The work of collecting began July 21st, at Southampton, from which place excursions were made to Shinnecock, Mecox and Peconic Bays and to the ocean beach. The writer was assisted by Mr. Barton A. Bean, on behalf of the U. S. National Museum, during the first month of the explorations. Great South Bay was the scene of operations from August 12th until October 19th.

Fine-meshed seines, a gill net of two-inch stretch-mesh and a trawl line with about 200 hooks were the principal means of capturing the fishes, and a few interesting species were obtained from the haul seines and set nets of fishermen on the ocean

beach and the pound nets in Great South Bay.

A noteworthy feature was the absence of many fishes which had been taken during the summer and fall months in previous years. Among them are: *Albula vulpes*, *Etrumeus sadina*, *Clupea harengus*, *Pomolobus aestivalis*, *Stolephorus argyrophanus*, *Fistularia tabacaria*, *Sphyraena borealis*, *Decapterus punctatus*, *Vomer setipinnis*, *Trachinotus falcatus*, *Trachinotus argenteus*, *Lagodon rhomboides*, *Leiostomus xanthurus*, *Acanthocottus aeneus*, *Hemitripterus americanus* and *Platophrys ocellatus*. Two things contributed to this condition, the prevalence of southerly winds, causing rough seas on the ocean beaches, and high water temperature which kept the migratory fishes well to the north of Long Island until late in October. A very serious hindrance to seining in most parts of the bays was the abundance of living and dead sea weeds near the shores, and another great obstacle was found in the sunken stakes scattered by ice and storms from the fences used as sea-weed collectors.

The sand shark (*Carcharias littoralis*) was abundant on the grassy shallows south of Toby's Flat until the middle of September, when it migrated westward. It preyed upon mullet, eels and flatfish, and, on account of its habit of swimming slowly near the surface, was easily captured by spears from a row boat. A young mackerel shark (*Lamna cornubica*), about three feet long, was caught in a gill net set in the ocean off Southampton. Other sharks secured were the dusky shark (*Carcharhinus obscurus*), the smooth dogfish (*Mustelus canis*) and the horned dogfish (*Squalus acanthias*).

The skates represented three species, *Raja erinacea*, *ocellata* and *eglanteria*, all of which were sufficiently common. They were often found feeding in shallow water near the shores, especially in the evening and night. A large male was taken by the hands, on the night of October 17th, in a

small dug-out creek emptying into Clam Pond Cove. It was at the edge of the shore and partly out of water, having followed the channel to the head of the creek and then failed to discover a way out.

A large menhaden (*Brevoortia tyrannus*) was captured by an osprey in Great South Bay and carried through the air fully two miles. The osprey was struck by a charge of shot and dropped its prey, which was then found to be alive. The young of the menhaden were migrating westward in large schools, swimming near the surface of the bay, on October 1st.

The lizard fish (*Synodus foetens*), which was obtained almost everywhere in Great South Bay in 1890, was almost entirely absent, only a single example having been secured.

The half-beak (*Hyporhamphus roberti*) was found in small numbers and was occasionally seen swimming in the water. Its movements are closely similar to those of the silver gar (*Tylosurus marinus*). This is one of the species captured at night by the use of a large reflector lantern. The light apparently dazes the fish so that it can easily be taken out of the water with a dip-net.

The small silverside (*Menidia beryllina*) occurs abundantly in fresh and brackish waters throughout the region explored and was once seined in salt water near Fire Island. On September 24th a young individual from Swan River measured one and one-sixteenth inches in length. The rough silverside (*Kirtlandia laciniiata*) was added to the New York fauna by the capture of an adult example in Mecox Bay, August 1st. This has the following characters: D. V, I, 7; A, I, 20; P. 14; V, I, 5; scales 7—47. It was associated with the common silverside (*Menidia notata*).

The red mullet (*Mullus auratus*) was obtained, October 17th, from a fish pound near Clam Pond Cove. Although the species

occurs occasionally as far north as Cape Cod, it seems to be recorded now for the first time from Long Island. It was seined by the writer at Sandy Hook, October 8, 1897, and was reported by fishermen to have been abundant there in September and October of that year.

The saurel (*Trachurus trachurus*) was secured in a gill net, October 16th, in Clam Pond Cove, along with young bluefish and menhaden. Young horse-crevallé (*Caranx hippos*) were obtained at several localities in Great South Bay, and the common crevallé (*Caranx cryos*) was brought from a pound near Clam Pond Cove late in October. The thread-fish (*Alectis ciliaris*) is represented by two individuals from a pound near Islip. The look-down (*Selene vomer*) was seined at Duncan's Creek, August 29th. The common compano (*Trachinotus carolinus*) made its appearance in October in the vicinity of Fire Island Inlet. Only the young were obtained.

The black rudder fish (*Palinurichthys perciformis*), usually occurring off shore under floating logs and boxes, made its way into Great South Bay, and one example was caught in Clam Pond Cove, October 11th, by Captain George Yarrington. *Eucinostomus gula*, formerly so abundant in northern waters in mid-summer, is represented in the collection by a single, very small individual, seined in Clam Pond Cove, August 22d.

The yellow tail or silver perch (*Bairdiella chrysura*), which was plentiful in all parts of Great South Bay in 1890, proved to be scarce everywhere except at Nichols' Point, where the young were collected in moderate numbers, September 1st.

A single *Chaetodon* (*C. ocellatus*) was obtained from a pound near Clam Pond Cove, October 17th. This is conspicuously beautiful on account of the orange color of its fins contrasting sharply with the dark bands on the head and body. The species was taken

also in Gravesend Bay in October, by Mr. W. I. De Nyse, who informs me that the roundish black spot in the soft dorsal remains fixed under all conditions, while the band extending from it to the anal fin sometimes disappears. The whole body of the fish at times appears to have an orange tinge, but at other times it is gray.

The rabbit-fish (*Lagocephalus leavigatus*) was not seen until October 14th, when a large individual was received from a pound near Clam Pond Cove. This was the only one obtained during the season.

The small-mouthed flounder (*Citharichthys microstomus*) was found in and near Fire Island Inlet on September 30th and October 11th. Ten individuals were taken, of which the largest is about four inches long. In 1890 this species was more abundant and occurred as far west as the Blue Point Life-Saving Station. In 1898 all but one of the recorded specimens were collected in a single haul of the seine.

The following record will serve as an illustration of the sudden changes occurring during the fall migrations: On October 11th, with southerly winds shifting to southwesterly and strong, two hauls were made with the gill net and three with the twenty-fathom seine; the fishes obtained were *Mugil cephalus*, *Mugil curema*, *Alutera schaeppii*, *Prionotus carolinus*, *Prionotus strigatus*, *Menidia notata*, *Fundulus majalis*, *Fundulus heteroclitus*, *Tautoga onitis* young, *Tylosurus marinus*, *Spherooides maculatus*, *Siphostoma fuscum*, *Hippocampus hudsonius*, *Citharichthys microstomus*, *Pseudopleuronectes americanus*, *Bothus maculatus*, *Stenotomus chrysops* young, *Synodus foetens*, *Menticirrhus saxatilis*, *Centropristes striatus* young. To these were added, on the same day, at Clam Pond Cove, several miles farther east, *Palinurichthys perciformis*, *Pomatomus saltatrix*, *Opsanus tau*, *Brevoortia tyrannus* young, and *Bairdiella chrysura*. On October 17th we worked over the same ground, the wind blowing from the

northeast, but gradually moderating. The gill net was hauled, but caught nothing. An orange filefish (*Alutera schaeppii*) was speared. We then looked around east and west along the shore and saw no fish except *Fundulus majalis* and *Menidia notata*. It should be noted, however, that on the same date a pound near Clam Pond Cove furnished us with *Chætodon ocellatus*, *Mullus auratus*, *Elops saurus*, *Caranx crysos*, *Raia ocellata*, *Raia erinacea*, *Alutera schaeppii*, *Mustelus canis* and *Stenotomus chrysops*, while the saurel (*Trachurus trachurus*) was present in Clam Pond Cove on the preceding day.

A large reflector lantern used for 'fire-lighting' eels at night was found useful for the capture of other fishes and for studying their attitudes and movements in the water. On the night of September 16th the lantern was held over the side of our sloop in Clam Pond Cove, and it attracted to us silver gar (*Tylosurus marinus*), killifish (*Fundulus majalis* and *F. heteroclitus*), silverside (*Menidia notata*), half beak (*Hyporhamphus roberti*), annelids (*Nereis sp.*), crabs, shrimp, beetles and moths. By means of a dip net it was easy to take any of the species. On the night of October 13th we were on the south shore of Great South Bay near Horsefoot Creek, spearing eels with the help of the lantern.

We took about twenty pounds of large eels, and nearly all of them were in very shallow water, close to the shore, hiding in the grass or on the sand bottom. One large eel, at the mouth of Horsefoot Creek, was standing on its head, boring for worms when it was speared. The silver gars and silversides played around the light, following it persistently in a semi-dazed fashion. Killifish, toadfish and many crabs were seen resting on the bottom, the toadfish sometimes lying on its side, with its tail curled toward its head. Young bluefish were seen darting out of the way occasionally. Sev-

eral quawks were fascinated by the lantern, and we pushed up close to them before they started off with owl-like motion and discordant cries.

The writer is now able, from personal studies, to report 163 species of fishes in waters extending from Gravesend Bay eastward to Mecox Bay, and refers to his articles published in the Nineteenth Annual Report of the New York Fish Commission (1890) and the Bulletin for 1897 of the American Museum of Natural History, New York City.

The marine fishes now certainly known in the New York fauna represent 200 species. The fresh waters contain 116 species, and there are, besides, 13 anadromous forms. The list might be further increased by the addition of the following fishes concerning whose pertinence to the fauna there is more or less doubt: *Lucius vermiculatus*, *Seriola lalandi*, *Coryphaena equisetis*, *Boleosoma nigrum*, *Polyprion americanus*, *Epinephelus niveatus*, *Dules auriga*, *Zenopsis ocellatus*, *Sphe-roides trichocephalus*, *Aspidophoroides monopterygius*, *Ulvaria subbifurcata*, *Stichæus punctatus*, *Leptoblennius serpentinus*, *Cryptacan-thodes maculatus*, *Anarhichas lupus*, *Trigla cuculus*, *Brosmius brosme*, *Hippoglossoides platessoides*, *Ogcocephalus vespertilio*.*

Thus, a catalogue of the New York fishes, based upon our present knowledge and including the foregoing 19 forms doubtfully assigned to the fauna, will contain 348 species. It should be remembered that no systematic account of the fishes has been published since 1842, and many large regions of the State are almost, or altogether, unknown to the ichthyologist.

TARLETON H. BEAN.

* The bat-fish must be transferred to the list of species known to occur in New York. Dr. Théodore Gill, in the mid-summer of 1854 or 1855, saw a recently-caught example of it at a wharf at the foot of 27th Street, East River, New York. No record of its occurrence was published.

SUPPRESSION OF SMOKE.

THE devising of practicable methods of reduction of the 'smoke nuisance' has become one of the most important problems in applied science for our time, and has been a subject of experiment and of legislation for many years past. Of late, some success has been met with on both sides the Atlantic. In St. Louis, perhaps, as great success has been attained as in any city in the United States, through the public-spirited cooperation of the city government, the Board of Trade and the scientific men and leading engineers of the place; but there remains much to be done and investigations are still in progress, some of which are important. Recent discussions at Philadelphia, under the auspices of the Franklin Institute,* have thrown much light upon the subject and have afforded many valuable facts and data.

We have now the published results of another and formal investigation by a commission, organized at Paris, composed of MM. Huet, Brull, Hirsch, Humblot, Lamouroux, Michel-Levy and DeTavernier, all holding important positions in the municipal administration, or in the great schools of mines and engineering, or as leading members of the Society of Civil Engineers. The commission was in session, at intervals, from June, 1894, to October, 1897. It made a study of reports and documents bearing upon the subject, conducted important experiments, reduced them to order and studied out definite conclusions, and also investigated the origin, state and the progress of the art, completing its report at the last-named date. This document of over 150 pages, large 8vo, with 25 plates, is now in process of distribution.†

Although more or less attention had been

* Journal Franklin Institute, June, 1897.

† "Concours pour la suppression des fumées produites par les foyers de chaudières à vapeur. Rapport de la Commission technique. Prefecture du Depart-